

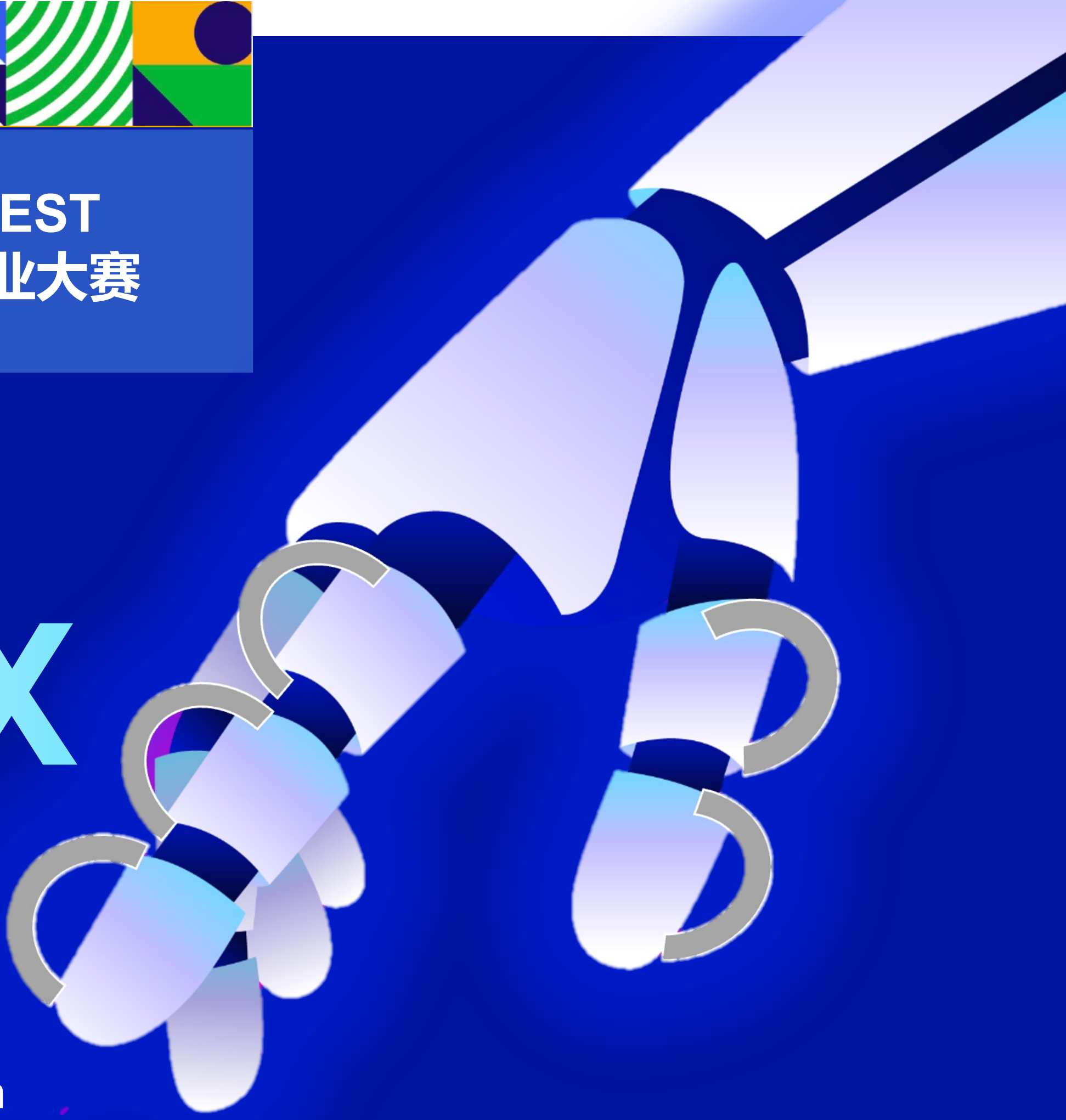


iCAN INNOVATION CONTEST
第十九届iCAN大学生创新创业大赛



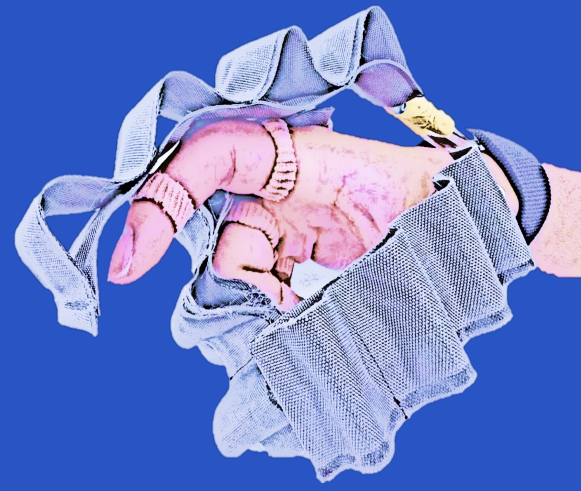
SoftGripX

Pneumatic Rehabilitation Gripper



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Project Overview

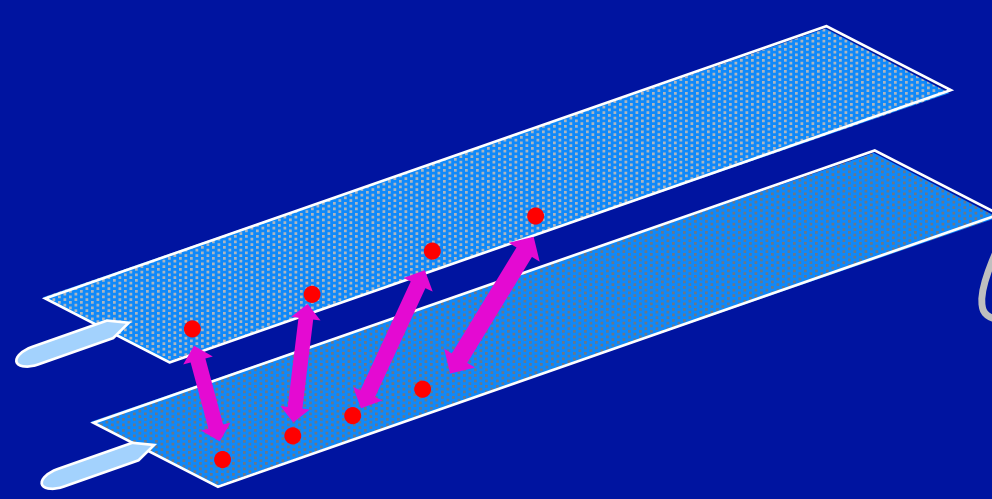


In 2024, there were over 120 million stroke cases worldwide, with up to 75% of patients suffering from impaired hand function, severely affecting their daily lives. However, most rehabilitation devices currently available on the market remain expensive, structurally complex, and equipped with rigid exoskeletons, which may lead to secondary injuries.

SoftGripX innovatively uses a **nylon outer shell with a rubber inner bladder** to form a flexible air chamber. When **inflated**, the chamber bends to drive finger flexion. The device has no rigid exoskeleton, ensuring full hand conformity. Each chamber is controlled by **PID closed-loop pressure regulation**, allowing users to choose different pressure levels for grasp training.

Hardware Design

The outer shell is made by heat-pressing nylon fabric with a TPU layer, with a latex balloon as the inner bladder. Air chambers on the upper and lower layers are fixed at different intervals to form a single gripper: the upper chambers bend when inflated, while the lower chambers straighten.



Bend

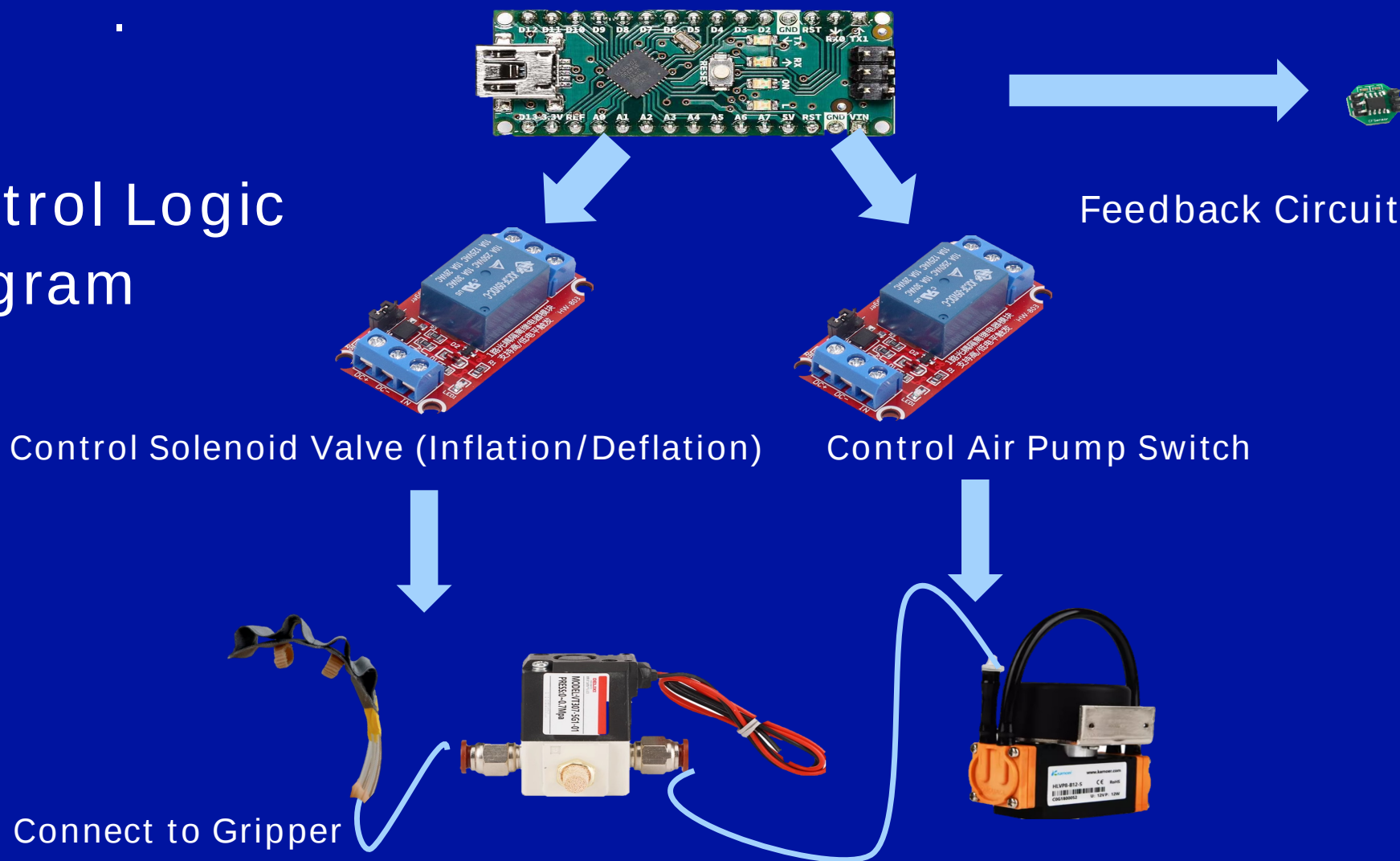
Rest

Straighten

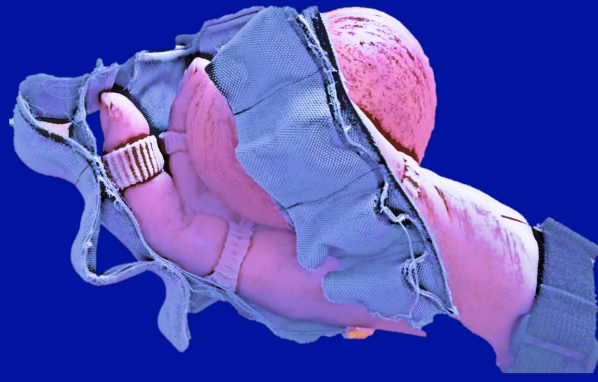
Circuit Connection

Relays control the air pump and solenoid valve to supply air. A pressure sensor monitors chamber pressure; when the target is reached, the pump stops, the valve closes, and the system holds pressure

Control Logic Diagram

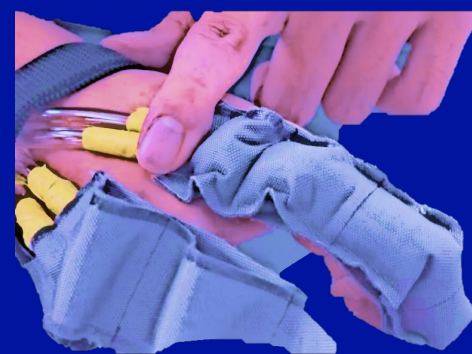


Key Advantages



Detachable chambers — enable single-finger use

Lightweight, non-restrictive — supports real object grasping



Customizable size — fabric easily tailored to user

User Interface



Users select a pressure level for grasping. **Function 1** — One-click grasp/release: choose low, medium, or high pressure, then press the button for a full clench – release cycle.

Function 2 — Finger exercise mode: the system runs a fixed sequence where fingers bend and straighten in turn.



simulate rehabilitation rhythms.

Software Logic

